

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.TECH. AUTOMOBILE ENGINEERING****COURSE STRUCTURE & SYLLABUS (2016-17)****II YEAR I SEMESTER**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	MA301BS	Mathematics - IV	4	1	0	4
2	ME303ES	Mechanics of Solids	3	0	0	3
3	ME305ES	Metallurgy & Material Science	3	0	0	3
4	EC303ES	Electrical Technology	4	1	0	4
5	AM305MS	Industrial Management	4	0	0	4
6	ME307ES	Mechanics of Solids Lab	0	0	3	2
7	AM308ES	Metallurgy Lab	0	0	3	2
8	EE308ES	Electrical & Electronics Engineering Lab	0	0	3	2
9	*MC300HS	Gender Sensitization Lab	0	0	3	0
		<b>Total Credits</b>	<b>18</b>	<b>2</b>	<b>12</b>	<b>24</b>

**II YEAR II SEMESTER**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	AM401ES	Production Technology	4	1	0	4
2	ME404ES	Thermodynamics	4	1	0	4
3	ME402ES	Kinematics of Machinery	4	1	0	4
4	AM403ES	Alternative Fuels For Automobiles	3	0	0	3
5	SM406MS	Fundamentals of Management	3	0	0	3
6	AM408ES	Machine Drawing Practice Lab	0	0	3	2
7	ME406ES	Fuels and Lubricants Lab	0	0	3	2
8	AM407ES	Production Technology Lab	0	0	3	2
9	*MC400ES	Environmental Science and Technology	3	0	0	0
		<b>Total Credits</b>	<b>21</b>	<b>3</b>	<b>12</b>	<b>24</b>

**MA301BS: MATHEMATICS - IV**  
**(Complex Variables and Fourier Analysis)**

**B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Prerequisites:** Foundation course (No Prerequisites).

**Course Objectives:** To learn

- differentiation and integration of complex valued functions
- evaluation of integrals using Cauchy's integral formula
- Laurent's series expansion of complex functions
- evaluation of integrals using Residue theorem
- express a periodic function by Fourier series and a non-periodic function by Fourier transform
- to analyze the displacements of one dimensional wave and distribution of one dimensional heat equation

**Course Outcomes:** After learning the contents of this paper the student must be able to

- analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
- find the Taylor's and Laurent's series expansion of complex functions
- the bilinear transformation
- express any periodic function in term of sines and cosines
- express a non-periodic function as integral representation
- analyze one dimensional wave and heat equation

**UNIT – I**

**Functions of a complex variable:** Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions-Milne-Thompson method

**UNIT - II**

**Complex integration:** Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series- Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).

**UNIT – III**

**Evaluation of Integrals:** Types of real integrals:

(a) Improper real integrals  $\int_{-\infty}^{\infty} f(x)dx$                       (b)  $\int_c^{c+2\pi} f(\cos \theta, \sin \theta)d\theta$

Bilinear transformation- fixed point- cross ratio- properties- invariance of circles.

#### **UNIT – IV**

**Fourier series and Transforms:** Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series.

Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine, transforms, properties, inverse transforms, Finite Fourier transforms.

#### **UNIT – V**

**Applications of PDE:** Classification of second order partial differential equations, method of separation of variables, Solution of one dimensional wave and heat equations.

#### **TEXT BOOKS:**

1. A first course in complex analysis with applications by Dennis G. Zill and Patrick Shanahan, Johns and Bartlett Publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
3. Advanced engineering Mathematics with MATLAB by Dean G. Duffy

#### **REFERENCES:**

1. Fundamentals of Complex Analysis by Saff, E. B. and A. D. Snider, Pearson.
2. Advanced Engineering Mathematics by Louis C. Barrett, McGraw Hill.

## ME303ES: MECHANICS OF SOLIDS

B.Tech. II Year I Sem.

L T P C  
3 0 0 3

### UNIT - I

**Simple Stresses & Strains:** Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

### UNIT - II

**Shear Force and Bending Moment :** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

### UNIT - III

**Flexural Stresses :** Theory of simple bending – Assumptions – Derivation of bending equation:  $M/I = f/y = E/R$  Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

**Shear Stresses:** Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

### UNIT - IV

**Principal Stresses and Strains:** Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

**Theories of Failure:** Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

### UNIT - V

**Torsion of Circular Shafts :** Theory of pure torsion – Derivation of Torsion equations :  $T/J = q/r = N\theta/L$  – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

**Thin Cylinders:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells.

**TEXT BOOKS:**

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH

**REFERENCES:**

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol –I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
5. Strength of Materials by S.S.Rattan, Tata McGraw Hill Education Pvt. Ltd.
6. Fundamentals of Solid Mechanics by M.L.Gambhir, PHI Learning Pvt. Ltd
7. Strength of Materials by R.K Rajput, S.Chand & Company Ltd.

## ME305ES: METALLURGY AND MATERIALS SCIENCE

B.Tech. II Year I Sem.

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### UNIT – I

**Structure of Metals:** Crystallography, Miller's indices, Packing Efficiency, Density calculations. Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods.

**Constitution of Alloys:** Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

### UNIT – II

**Phase Diagrams:** Construction and interpretation of phase diagrams, Phase rule. Lever rule. Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

### UNIT – III

**Engineering Materials –I steel:**

**Iron-Carbon Phase Diagram and Heat Treatment:** Study of Fe-Fe<sub>3</sub>C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening and Tempering of steels, Hardenability. Alloy steels.

### UNIT – IV

**Engineering Materials –II: Cast Irons:** Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron. **Engineering Materials-III: Non-ferrous Metals and Alloys:** Structure and properties of copper and its alloys, Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys.

### UNIT – V

**Engineering Materials –IV: Ceramics, Polymers and Composites:** Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties, and applications of composites. Classification, Properties, and applications of Polymers.

### TEXT BOOKS:

1. Material Science and Metallurgy/ Kodgire
2. Essentials of Materials Science and engineering / Donald R. Askeland / Thomson.

### REFERENCES:

1. Introduction to Physical Metallurgy / Sidney H. Avner.
2. Materials Science and engineering / William and Callister.
3. Elements of Material science / V. Rahghavan
4. Engineering Material and Metallurgy – Er Amandeep Singh Wadhva
5. Materials Science for Engineering Students- Traugott Fischer 2009 Edition.

## EC303ES: ELECTRICAL TECHNOLOGY

**B.Tech. II Year I Sem.**

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### **Course Objectives:**

- To know the basic principle of DC generators and motors.
- To know the basic principle of single phase transformers.
- To understand the basic principle of three-phase induction motor and alternators.
- To understand the basic principle of special motors and electrical instruments.

### **Course Outcome:**

- To analyze the performance of dc generators and motors.
- To analyze the performance of transformers.
- To learn the in-depth knowledge on three phase induction motors.
- To analyze the performance of special motors and electrical instruments in real time applications.

### **UNIT - I**

**D.C Generators and DC Motors:** Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators, DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

### **UNIT - II**

**Transformers & Performance:** Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit, Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation (Simple Problems).

### **UNIT - III**

**Three Phase Induction Motor:** Principle of operation of three-phase induction motors – Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.

### **UNIT - IV**

**Alternators:** Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.

### **UNIT - V**

**Special Motors & Electrical Instruments :** Principle of operation - Shaded pole motors – Capacitor motors, AC servomotor, AC tachometers, Synchros, Stepper Motors –

Characteristics, Basic Principles of indicating instruments – Moving Coil and Moving iron Instruments (Ammeters and Voltmeters).

**TEXT BOOKS:**

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering - T.K. Nagasarkar and M. S. Sukhija, Oxford University Press, 2005

**REFERENCES:**

1. Principles of Electrical Engineering - V.K Mehta, S. Chand Publications.
2. Theory and Problems of basic electrical engineering - I.J. Nagarath and D.P Kothari, PHI Publications
3. Essentials of Electrical and Computer Engineering - David V. Kerns, JR. J. David Irwin



## AM305MS: INDUSTRIAL MANAGEMENT

B.Tech. II Year I Sem.

L T P C  
4 0 0 4

### UNIT - I

**Introduction to Management:** Entrepreneurship and organization - Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management

### UNIT - II

**Designing Organizational Structures:** Departmentation and Decentralization, Types of Organization structures - Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

### UNIT - III

**Operations Management:** Objectives- product design process- Process selection-Types of production system (Job, batch and Mass Production),-Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts-Design of product layout- Line balancing(RPW method)

Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

### UNIT - IV

**Work Study:** Introduction – definition – objectives – steps in work study – Method study – definition – objectives – steps of method study. Work Measurement – purpose – types of study – stop watch methods – steps – key rating – allowances – standard time calculations – work sampling.

**Statistical Quality Control:** variables-attributes, Shewart control charts for variables- $\bar{X}$  chart, R chart, - Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

### UNIT - V

**Job Evaluation:** methods of job evaluation – simple routing objective systems – classification method – factor comparison method – point method – benefits of job evaluation and limitations.

**Project Management (Pert/Cpm):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

**TEXT BOOKS:**

1. Industrial Engineering and Management/O.P. Khanna/Khanna Publishers
2. Industrial Engineering and Management Science/T.R. Banga and S.C. Sarma/Khanna Publishers.

**REFERENCE BOOKS:**

1. Motion and Time Study by Ralph M Barnes/ John Willey & Sons Work Study by ILO
2. Human factors in Engineering & Design/Ernest J McCormick / TMH
3. Production & Operation Management /Paneer Selvam /PHI
4. Industrial Engineering Management/NVS Raju/Cengage Learning
5. Industrial Engineering Hand Book /Maynard
6. Industrial Engineering Management / RaviShankar/ Galgotia

## ME307ES: MECHANICS OF SOLIDS LAB

**B.Tech. II Year I Sem.**

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### Course Objectives:

The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

The students will advance the students' development of the following broad capabilities:

1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
  2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
  3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
  4. Students will understand how to calculate normal and shear stresses on any cross-section of a beam. Different cross-sections (including I-beam) will be discussed and applied
- Continuous Assessment Test 10 marks Mid Semester Test 15 marks End

### Course Outcomes

1. Analyze the behavior of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods
4. Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
5. Expectation and capacity to undertake lifelong learning.

### Any 10 experiments from the following

1. Direct tension test
2. Bending test on Simple supported beam
- 3 Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test

6. Rockwell hardness test
7. Test on springs
8. Compression test on cube
9. Izod Impact test
- 10 .Charpy Impact test
11. Punch shear test

## AM308ES: METALLURGY LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	2

**Any 10 experiments from the following:**

1. Study of Metallographic Specimen preparation
2. Study of the Micro Structure of pure ferrous metals
3. Study of the Micro Structure of pure Non ferrous metals
4. Study of the Microstructure of plain carbon steels.
5. Study of the Micro Structures of Cast Irons.
6. Study of the Micro Structures of Non-Ferrous alloys.
7. To carry out the annealing treatment to the given plain carbon steel and study of the Micro structures and hardness
8. To carry out the Normalizing treatment to the given plain carbon steel and study of the Micro structures and hardness
9. To carry out the Hardening treatment to the given plain carbon steel and study of the Micro structures and hardness
10. To carry out the tempering treatment to the given hardened plain carbon steel and study of the Micro structures and hardness
11. Determine Hardenability of a given steels by Jominy End Quench Test.

## EE308ES: ELECTRICAL AND ELECTRONICS ENGINEERING LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	2

### SECTION A: ELECTRICAL ENGINEERING:

1. Verification of KCL and KVL.
2. Magnetization characteristics of D.C. Shunt generator.
3. Speed control of DC motor.
4. Swinburne's Test on DC shunt machine.
5. Brake test on DC shunt motor.
6. OC and SC tests on Single-phase transformer.
7. Brake test on 3-phase Induction motor.
8. Regulation by an alternator by synchronous impedance method.

### SECTION B: ELECTRONICS ENGINEERING:

1. PN Junction Diode Characteristics (Forward bias, Reverse bias)
2. Transistor CE Characteristics (Input and Output)
3. Study of CRO.
4. Zener Diode Characteristics
5. Transistor CE Characteristics
6. Rectifier without Filters (Full wave & Half wave)
7. Rectifier with Filters (Full wave & half wave).

**Note:** Total 12 experiments are to be conducted. (Six experiments from PART-A, Six experiments from PART-B)

## MC300HS: GENDER SENSITIZATION LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	0

### Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

### Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

### UNIT - I

#### UNDERSTANDING GENDER

**Gender:** Why Should We Study It? (*Towards a World of Equals*: Unit -1)

**Socialization:** Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

### UNIT - II

#### GENDER AND BIOLOGY

**Missing Women:** Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)  
Declining Sex Ratio. Demographic Consequences.

**Gender Spectrum:** Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many? Struggles with Discrimination.

## UNIT - III

### GENDER AND LABOUR

**Housework:** the Invisible Labour (*Towards a World of Equals*: Unit -3)

“My Mother doesn’t Work.” “Share the Load.”

**Women’s Work:** Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

## UNIT - IV

### ISSUES OF VIOLENCE

**Sexual Harassment:** Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “Chupulu”.

**Domestic Violence:** Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-“I Fought for my Life...” - Additional Reading: The Caste Face of Violence.

## UNIT - V

### GENDER: CO - EXISTENCE

**Just Relationships:** Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

### TEXTBOOK

All the five Units in the Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**, Telangana State in the year **2015**.

**Note:** Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

### REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. “*I Fought For My Life...and Won.*” Available online at: <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/>



## AM401ES: PRODUCTION TECHNOLOGY

**B.Tech. II Year II Sem.**

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<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

### UNIT - I

**Casting:** Steps involved in making a casting - Its applications - Patterns and Types of patterns – Pattern allowances and their construction. Types of casting processes – Solidification of casting.

### UNIT - II

**Welding:** welding Types - Oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding – Resistance welding, Thermit welding.

### UNIT - III

Inert Gas Welding, TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding, Laser Welding Soldering and Brazing, Heat affected zone in welding. Welding defects – causes and remedies – destructive and non- destructive testing of welds.

### UNIT - IV

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth, Comparison of properties of Cold and Hot worked parts, rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements  
Stamping, forming and other cold working processes : Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning – Types of presses and press tools. Forces and power requirement for the above operations.

### UNIT - V

**Extrusion Of Metals:** Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion  
**Forging Processes:** Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging. **Forging hammers:** Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

### TEXT BOOKS:

1. Manufacturing Technology (Vol. 1) / P.N. Rao/TMH/2<sup>nd</sup> Edition
2. Workshop Technology (Vol. 1) /Hajra Chowdary/Asia Publishing House/2<sup>nd</sup> Edition

### REFERENCE BOOKS:

1. Production Technology /Sarma P C /S.Chand
2. Production Technology / R.K. Jain/Khanna Publishers

3. Metal Casting / T.V Ramana Rao / New Age
4. Principles of Metal Castings / Rosenthal/TMH
5. A Course in Workshop Technology/B.S. Raghuwamshi /Dhanpat rai & Sons
6. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

## ME404ES: THERMODYNAMICS

B.Tech. II Year II Sem.

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### UNIT – I

**Introduction: Basic Concepts:** System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale- Joule’s Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

### UNIT - II

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump , Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot’s principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

### UNIT – III

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes. Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables-

Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

### UNIT - IV

Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton’s Law of partial pressure, Avogadro’s Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific

Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric chart.

#### **UNIT - V**

**Thermodynamic Cycles :** Power cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

**Refrigeration Cycles:** Bell-Coleman cycle- Vapour compression cycle-performance Evaluation.

#### **TEXT BOOKS:**

1. Engineering Thermodynamics / PK Nag /TMH, 5th Edition
2. Engineering Thermodynamics/E Rathakrishnan/PHI/Second Edition/2013

#### **REFERENCE BOOKS:**

1. Engineering Thermodynamics/DP Mishra/ Cengage Learning/Second impression 2012
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
3. Thermodynamics – J.P.Holman / McGrawHill
4. Engineering Thermodynamics – Jones & Dugan
5. Engineering Thermodynamics/P.Chattopadhyay/Oxford Higher Education/Revised First Edition
6. Thermodynamics & Heat Engines – Yadav – Central Book Depot, Allahabad.

## ME402ES: KINEMATICS OF MACHINERY

B.Tech. II Year II Sem.

L T P C  
4 1 0 4

### UNIT - I

**Mechanisms** : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained . Classification of kinematic chain – inversion of mechanism – inversions of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

**Straight Line Motion Mechanisms** : Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russel – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph

### UNIT - II

**Kinematics:** Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

Analysis of Mechanisms: Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

**Plane motion of body:** Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

### UNIT - III

**Steering Mechanisms:** Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio. Single and double Hooke's joint – Universal coupling – application – problems.

**CAMS:** Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

### UNIT - IV

**Higher pairs, friction wheels and toothed gears** – types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

**Gear Trains:** Introduction – Train value – Types – Simple and reverted wheel train –

Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains.  
Selection of gear box-Differential gear for an automobile

#### **UNIT - V**

**Belt Rope and Chain Drives** : Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

#### **TEXT BOOKS**

1. Theory of Machines by Thomas Bevan, CBS
2. Theory of Machines - R.K Bansal
3. Theory of Machines R.S Khurmi & J.K Gupta

#### **REFERENCES:**

1. Theory of machines – Rattan .S.S., TMH, 2009 Edition
2. Theory of Machines Sadhu Singh Pearsons Edn
3. Mechanism and Machine Theory / JS Rao and RV Dukupati / New Age
4. Theory of Machines / Shigley / Oxford

## AM403ES: ALTERNATE FUELS FOR AUTOMOBILES

**B.Tech. II Year II Sem.**

L	T	P	C
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### UNIT - I

**Compressed Natural Gas (CNG) :** Introduction-History of CNG-Production of CNG-properties of CNG-CNG storage-Piping for CNG-Advantages and Disadvantages of CNG-CNG dispensing systems-CNG transportation-Material compatibility for CNG-CNG fuel kits-Engine modifications for CNG operations-CNG combustion- Stoichiometric vs. Lean burn CNG engines- Engine optimization- Vehicle emission from CNG- After treatment of CNG exhaust – CNG fuelling station safety systems- CNG standards and regulations - Third - party inspection for alternative fuels vehicles. CNG vehicles world wide –in India.

### UNIT - II

**Liquefied Natural Gas (LNG):** Introduction-history LNG-production of LNG – properties-economics of LNG- Advantages and Disadvantages-transportation and storage of LNG-Piping for LNG-LNG dispensers-LNG to CNG conversion system-regulations for LNG-LNG vehicle world wide- Vehicle performance characteristics for LNG- Vehicle emissions from LNG-LNG India.

**Liquefied Petroleum Natural Gas (LPG):** Introduction-History of LPG- Production of LPG- properties, Storage of LPG-dispensing of LPG-LPG nozzles and receptacles-material compatibility for LPG- Piping, safety systems and transportation of LPG-Advantages and disadvantages of LPG-LPG engine developments-LPG fuel kits and combustion, Emission from LPG-LPG Standards-LPG Vehicle world wide-LPG Scenario in India

### UNIT - III

**Liquefied Hydrogen:** Properties of Hydrogen- Production of hydrogen-photochemical production of Hydrogen – Algal production of Hydrogen(Bio Hydrogen)-On- board storage of Hydrogen-metal hydrates-compressed hydrogen gas- activates carbon storage-Hazards with LH<sub>2</sub>- Advantages and Disadvantages of LH<sub>2</sub>- Transportation of LH<sub>2</sub>-Piping for LH<sub>2</sub>- Dispensers for LH<sub>2</sub>. vehicle emissions from LH<sub>2</sub>- BMW liquid hydrogen cars - liquid hydrogen in India.

**Bio-Fuels:** Bio gas – Methanol- Ethanol- Butanol- straight vegetable oil – bio diesels-properties – production- storage methods – power densities- advantages and disadvantages over conventional fuels- specific design criteria use in automobiles.

### UNIT - IV

**Electric vehicles:** Introduction- batteries electric vehicle-components of EV- EV batteries-EV chargers- EV drives- EV tractive force -EV transmission-EV motor design- EV Power devices and controllers-Advantages and Disadvantages-Performance characteristics- testing – EV challengers- EV scenario in India-Hybrid electric vehicles- International status of Hybrid EVs-HEV batteries- HEV ultra capacitors- HEV motors- HEV transmissions- drive train components, HEV performance specifications.

## **UNIT-V**

**Fuel cell Power vehicles:** Fuel cell vehicle-Benefits of fuel cells for automotive industry-Basics, efficiency and types of fuel cells-Fuel cell options for fuel cell vehicle-fuel regulations- Fuel cell hybrid vehicle- Fuel cell solar vehicle, Solar photovoltaic cell, Solar car electrical system and drive train, solar array-solar car body and chassis-Hybrid gas turbine EV – Nuclear car-road map for alternative power trains.

### **TEXT BOOKS:**

1. Alternative fuels/ SS Thipse/ JAICO Publishers/ 2010
2. Alternative fuel technology/ Erjavec, Arias/ Yesdee Publications/ 2009

### **REFERENCES:**

1. A text book of alternative fuel of Automobile Engine, Ramireddy and Yousuf, Front line Publishers
2. The Complete Idiot's Guide to Hybrid and Alternative Fuel Vehicles by Jack R. Nerad.
3. Hybrid and Alternative Fuel Vehicles (New Edition) by James D. Halderman
4. Powering Your Vehicle With Straight Vegetable Oil *by Forest Gregg*



## SM406MS: FUNDAMENTALS OF MANAGEMENT

**B.Tech. II Year II Sem.**

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**Course Objective:** To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills.

**Course Outcome:** The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

### UNIT - I

**Introduction to Management:** Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

### UNIT - II

**Planning and Decision Making:** General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

### UNIT - III

**Organization and HRM:** Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.

Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

### UNIT - IV

**Leading and Motivation:** Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership.

Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

#### **UNIT - V**

**Controlling:** Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

#### **TEXT BOOKS:**

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

#### **REFERENCES:**

1. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

## AM408ES: MACHINE DRAWING PRACTICE LAB

**B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### **PART - A**

**Machine Drawing Conventions:** Need for drawing conventions – introduction to ISI conventions - Conventional representation of materials, common machine elements such as screws, nuts, bolts, keys, gears, webs, ribs. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features. Title boxes, their size, location and details - common abbreviations and their liberal usage. Types of Drawings – working drawings for machine parts.

**Drawing of Machine Element:** Simple parts - Selection of Views, additional views for the following machine elements and parts with every drawing proportions. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws. Keys, cottered joints and knuckle joint. Rivetted joints for plates. Shaft coupling, spigot and socket pipe joint. Journal, pivot and collar and foot step bearings.

### **PART- B**

**Assembly Drawings:** Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions. Engine parts – stuffing boxes, cross heads, Eccentrics - Connecting Rod – Piston Assembly. Machine tool parts: Tail stock, Tool Post, Machine Vices - Screws jacks- Plummer block. **Valves:** Spring loaded safety valve, feed check valve and air cock.

**Note:** First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

**Question Paper:** Should have 25% for Part A - 3 out of 4 Questions and 75% for Part B- No choice one assembly figure

### **TEXT BOOK:**

1. Machine Drawing /K. L. Narayana/ New Age International Publishers
2. Textbook of Machine Drawing/K.C. John/PHI/Eastern Economy Edition

### **REFERENCE BOOKS:**

1. Machine Drawing / P.S.Gill.
2. Machine Drawing / Junnarkar N.D./ Pearson Edu.
3. Machine Drawing/Bhattacharya/Oxford University Press
4. Machine Drawing/N.D. Bhat/ Charotar
5. A Textbook of Machine Drawing/R. K. Dhawan/ S. Chand.

## ME406ES: FUELS AND LUBRICANTS LAB

**B.Tech. II Year II Sem.**

L	T	P	C
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**Prerequisite:** Chemistry

**Course Objectives:** To Understand the fuel and lubricants properties.

### **List of Experiments:**

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus
2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens Apparatus
3. Carbon residue test: Liquid fuels.
4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer
5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer
6. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer
7. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.
8. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.
9. Drop point and Penetration Apparatus for Grease.
10. ASTM Distillation Test Apparatus.
11. Cloud and Pour point Apparatus.

## AM407ES: PRODUCTION TECHNOLOGY LAB

**B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### List Of Experiments

#### **I. Metal Casting Lab:**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

#### **II Welding Lab:**

1. ARC Welding Lap & Butt Joint - 2 Exercises
3. Spot Welding - 1 Exercise
4. TIG Welding - 1 Exercise
5. Plasma welding and Brazing - 2 Exercises  
(Water Plasma Device)

#### **III Mechanical Press Working:**

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
3. Hydraulic Press: Deep drawing and extrusion operation.
4. Bending and other operations

#### **IV Processing Of Plastics**

1. Injection Moulding
2. Blow Moulding

Minimum of 12 Exercises need to be performed.

#### **REFERENCE BOOK:**

1. Dictionary of Mechanical Engineering – G.H.F. Naylor, Jaico Publishing House.

## MC400ES: ENVIRONMENTAL SCIENCE AND TECHNOLOGY

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	0

### Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations

### Course Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development

### UNIT - I

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

### UNIT - II

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

### UNIT - III

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

### UNIT - IV

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics

of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

#### **UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

#### **TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

#### **REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.